I CLAIM:

1. An internal combustion engine arrangement comprising:

a spark-ignited internal combustion engine;

an exhaust line receiving exhaust gas from the internal combustion engine;

an oxide gas absorber in the exhaust line including a support member; and an absorption layer on a surface of the support member having an enlarged surface area accessible to exhaust gas flowing through the exhaust line for reversible absorption at least one nitrogen oxide (NO_x) and/or at least one oxide of sulfur (SO_x); and,

a control unit for controlling the temperature of the absorption layer by adjusting parameters of the exhaust gas so that the absorption layer can be heated to a temperature at which the layer is regenerated by desorbing absorbed NO_x or SO_x.

2. An internal combustion engine arrangement according to claim 1 wherein the support member is a metal support member.

3. An internal combustion engine arrangement according to claim 2 wherein the metal support member is a metal foil.

4. An internal combustion engine arrangement according to claim 2 wherein the metal support member is heatable by application of an electric current.

5. An internal combustion engine arrangement according to claim 2 wherein the metal support member has a wall thickness ≤ 0.1 mm.

6. An internal combustion engine arrangement according to claim 5 wherein the metal support member has a wall thickness ≤ 0.06 mm.

7. An internal combustion engine arrangement according to claim 1 wherein the support member contains a plurality of parallel passages having a closed cross-section through which exhaust gas can be passed and the absorption layer is on the inside surface of the passages.

8. An internal combustion engine arrangement according to claim 7 wherein at least some of the passages have a structure causing turbulent gas flow at least over a portion of the passage.

9. An internal combustion engine arrangement according to claim 8 wherein the structure causing the turbulent gas flow is at least one of: (a) a variation in cross-section; (b) a corrugation; and (c) a twisting or curvature of the passages.

10. An internal combustion engine arrangement according to claim 7 wherein the oxide gas absorber is subdivided into a plurality of segments.

11. An internal combustion engine arrangement according to claim 10 wherein the plurality of segments have at least one of: (a) different lengths; (b) different passage cross-sections; (c) different numbers of passages; and (d) spacing between segments of at least 50 cm.

12. An internal combustion engine arrangement according to claim 1 wherein the enlarged surface area provides an area of at least 20 m^2 accessible to the exhaust gas per gram of the absorption layer.

13. An internal combustion engine arrangement according to claim 12 wherein the enlarged surface area provides an area of at least 40 m^2 accessible to the exhaust gas per gram of the absorption layer.

14. An internal combustion engine arrangement according to claim 13 wherein the enlarged surface area provides an area of at least 100 m^2 accessible to the exhaust gas per gram of the absorption layer.

15. An internal combustion engine arrangement according to claim 1 wherein the absorption layer contains an aluminum oxide.

16. An internal combustion engine arrangement according to claim 15 wherein the absorption layer contains gamma aluminum oxide.

17. An internal combustion engine arrangement to claim 1 wherein the absorption layer contains an element selected from the group consisting of alkali metals, alkaline-earth metals, rare earths, lanthanum, titanium, copper and manganese..

18. An internal combustion engine arrangement according to claim 1 wherein the absorption layer contains at least one of the elements barium, sodium and potassium.

19. An internal combustion engine arrangement according to claim 1 wherein the absorption layer absorbs NO_x and/or SO_x from an exhaust gas with an excess of oxygen during lean operation of the internal combustion engine.

20. An internal combustion engine arrangement according to claim 1 wherein the absorption layer releases NO_x and/or SO_x in a reducing atmosphere and/or at low oxygen concentration in the exhaust gas.

21. An internal combustion engine arrangement according to either of claim 19 or claim 20 including an oxygen concentration determining means for determining a value representing the oxygen concentration in the exhaust gas and suppling a signal representing the oxygen concentration as an input signal to the control unit, and wherein the control unit uses the oxygen concentration signal to control charging or discharging of the absorber.

22. An internal combustion engine arrangement according to claim 1 wherein the absorption layer desorbs NO_x and SO_x at an elevated temperature.

23. An internal combustion engine arrangement according to claim 22 including a temperature determining means for determining a value representing the temperature of at least one of: (a) the exhaust gas; (b) the absorption layer; and (c) the support member; and supplying a signal corresponding to that value as an input signal to the control unit for control of charging or discharging of the absorber.

24. An internal combustion engine arrangement according to claim 23 wherein the control unit receives signals representing both the oxygen concentration in the exhaust gas and the temperature of the exhaust gas as input signals.

25. An internal combustion engine arrangement according to claim 1 wherein the support member is a ceramic member and the absorption layer has a thickness of at least 50 microns.

26. An internal combustion engine arrangement according to claim 1 wherein the support member is a metal member and the absorption layer has a thickness of at least 25 microns.

27. An internal combustion engine arrangement according to claim 1 wherein the absorption layer is applied as a wash coat.

28. An internal combustion engine arrangement according to claim 1 wherein the absorption layer contains at least one precious metal.

29. An internal combustion engine arrangement according to claim 28 wherein the absorption containing the precious metal constitutes an oxidation catalyst or a three-way catalyst.

30. An internal combustion engine arrangement according to claim 1 wherein the absorption layer accessible to the exhaust gas has a pore volume of at least 0.2 cm^3/g.

~~31. An internal combustion engine arrangement according to claim 1 including an oxidation catalyst separate from the oxide gas absorber.~~

~~32. An internal combustion engine arrangement according to claim 31 wherein the oxidation catalyst is a three-way catalyst.~~

33. A method for removing at least one nitrogen oxide (NO_x) from the exhaust gas of an internal combustion engine, comprising the steps of:

(a) operating an internal combustion engine to produce an exhaust gas flow containing oxygen;

(b) passing exhaust gas containing oxygen over an absorber containing an absorbing layer on a surface of a support member;

(c) storing the NO_x in the absorbing layer;

(d) heating the absorbing layer to a predetermined temperature during the operation of the engine;

(e) producing an exhaust gas which is poor in oxygen or an exhaust gas having a stoichiometric excess of a reducing agent;

(f) desorbing the NO_x from the absorbing layer and reducing the NO_x in the exhaust gas which is poor in oxygen has a stoichiometric excess of reducing agent while the absorbing layer is a temperature equal to or above the predetermined temperature;

(g) again producing an exhaust gas containing oxygen;

(h) terminating heating of the absorbing layer to the predetermined temperature; and

(j) repeating steps (c) through (h).

34. A method according to claim 33 wherein the step of heating the absorbing layer is carried out by at least one of: (a) injecting fuel into the exhaust gas and catalytic combustion thereof, (b) varying the operating conditions of the internal combustion engine, (c) electrical heating of the absorbing layer and (d) using a burner to heat the exhaust gas.

35. A method according to claim 33 wherein, before the step of heating the absorbing layer at least to a predetermined temperature during operation of the internal combustion engine, a step of determining whether a temperature value representing the temperature of the absorbing layer is at or above the predetermined temperature is carried out and, if it is determined that the temperature value representing the temperature of the absorbing layer is at or above the predetermined temperature, steps (d) and (b) are omitted.

36. A method according to any one of claims 33-35 wherein the support member is a metal support member.

37. A method according to any one of claims 33-35 wherein at least one oxide of sulfur (SO_x) is also stored and desorbed by the absorbent layer.

38. A method according to any one of claims 33-35 wherein the desorption from the absorber layer is carried out at periodic intervals.

39. A method according to any one of claims 33-35 wherein the desorption from the absorbent layer is carried out depending on the amount of gas stored in the absorbent layer.

40. A method according to any one of claims 33- 35 wherein the absorbent layer contains gamma-aluminum oxide and at least one element in the group consisting of alkali metals, alkaline-earth metals, rare earths and lanthanum.

41. A method according to any one of claims 33-35 wherein the exhaust gas is passed over the absorbent layer with turbulence.

42. A method according to any one of claims 33-35 wherein the support member has a plurality of parallel passages..

43. A method according to claim 42 wherein the exhaust gas is passed over a plurality of support members containing the gas absorbing layer and having at least one of: (a) different numbers of passages; (b) passages of different flow diameters; and (c) spacings between the support members of at least 50 cm.

44. A method according to claim 42 wherein the support member has a plurality of twisted or curved passages.